

CLAIMS

1. A cooling or heating device in an absorption heat pump of GAX type, comprising a generator (1), a heat exchanger (2) of GAX type, an absorber (9B, 10B, 10C), a condenser (9A, 10A), an evaporator (10A-C, 9B), a pump (3) connected to said absorber and generator, a first circuit (15A-Z) for the refrigerant solution circulating through the device and connecting together at least said generator, GAX heat exchanger, absorber, condenser, evaporator and pump, and valve means (8) for modifying said first circuit (15A-Z) in such a manner as to vary the manner in which evaporator, absorber, condenser and evaporator are connected together; characterised by comprising at least a first and a second heat exchange means (9, 10) arranged to enable at least one phase of the solution circulating through said means to be changed and to enable thermal energy to be exchanged against an external fluid, said first and second heat exchange means (9, 10) each comprising at least two mutually separate sub-heat exchangers (9A-B, 10A-C) arranged to function either as an evaporator or as an absorber and condenser, depending on the operating mode of the device.
2. A device as claimed in claim 1, characterised in that when the device operates in cooling mode, the valve means (8) are arranged to modify the first circuit (15A-Z) in such a manner that the first heat exchange means (10) operates as an evaporator (9), one sub-heat exchanger (9A) of the second heat exchange means (9) operates as a condenser and the other (9B) operates as an absorber, whereas when the device operates in heating mode said valve means (8) are arranged to modify said first circuit (15A-Z) in such a manner that one sub-heat exchanger (10A) of the first heat exchange means (10) operates as a condenser and the other sub-heat exchanger (10B-C) operates as an absorber, and the second heat exchange means (9) operates as an evaporator.
3. A device as claimed in claim 1, characterised in that the heat exchange means (9, 10) comprising at least two separate sub-heat exchangers (10A-C, 9A-B) are only two in number.

4. A device as claimed in claim, 1, characterised by comprising a single hydraulic circuit (11) for the circulation of a liquid able to withdraw or receive thermal energy generated by the evaporator or by the condenser or by the absorber.

5 5. A device as claimed 1, characterised in that the first circuit (15A-Z) through which the solution/refrigerant circulates, and the valve means (8), are formed in such a manner as to avoid dead branches, i.e. branches not reached by said solution/refrigerant, in the two operating modes of the device.

10 6. A device as claimed in claim 1, characterised in that the second heat exchange means (9) are of the type in which heat exchange takes place between the refrigerant solution and the air circulating on the outside of said heat exchanger.

15 7. A device as claimed in claim 1, characterised in that the second heat exchange means (10) are of the type in which heat exchange takes place between the refrigerant solution and a circulating liquid both of which lie within said heat exchanger (10).

20 8. A device as claimed in claim 7, characterised in that the second heat exchange means (10) comprise a substantially tube-shaped casing having an inlet (11) and an outlet (11) for a first fluid, and a plurality of tubes disposed longitudinally in the interior of said casing; each tube being connected to an entry element and an exit element for a second fluid, the first fluid circulating within the interior of the casing (1) in contact with the outer solutions of said tubes; the tubes inside the casing being substantially
25 directly in contact with each other and with the inner walls of said casing and having a cross-section such as to form within the casing a plurality of micro-channels parallel to the tubes for circulation of the first fluid.

30 9. A device as claimed in claim 8, characterised in that between their entry and exit portions the tubes (2) present at least one portion having a cross-section of shape different from that of the adjacent tube portions, this shape being such as to at least partly break and remix the flow of fluid

circulating through the tube, in particular those portions of the tube (2) having a cross-section of different shape being formed of "telescope" shape and/or being in contact with each other, so as to maintain the tubes spaced apart.

5 10. A device as claimed in claim 8, characterised in that the heat exchanger is of "S" shape, the casing housing the tubes comprising, in particular, two semi-circular shells in correspondence with its curved portion.

11. A device as claimed in claim 7, characterised in that the second heat
10 exchange means (10) comprise three separate side-by-side sub-heat exchangers (10A-B).

12. A device as claimed in claim 1, characterised in that the valve means (8) consist of a single valve comprising a plurality of valve members (14A-N).

15 13. A device as claimed in claim 12, characterised in that the single valve (8) is a sixteen/fourteen-way valve.

14. A method for controlling the solution and/or refrigerant in a device claimed in the preceding claims, characterised by using the at least two separate sub-heat exchangers (9A-B, 10A-C) of the at least two heat
20 exchange means (9, 10) either as an evaporator or as an absorber and condenser, according to the mode of operation of the device.

15. A method for controlling the solution and/or refrigerant in a device claimed in one or more of claims from 1 to 13; characterised by avoiding dead branches, i.e. branches not reached by said solution and/or
25 refrigerant, in the two modes of operation of the device.